MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

PSM0325 – INTRODUCTION TO PROBABILITY AND STATISTICS
(Foundation in Information Technology / Life Sciences)

27 OCTOBER 2017
9.00a.m – 11.00a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **THREE** pages excluding the cover page and the Appendix.

2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided. All necessary working steps **MUST** be shown.

4. **Statistical table** is provided.

Instruction: Answer all **FIVE** questions.

Question 1 (10 marks)

Marks obtained by 50 students for a test are given below:

23, 50, 38, 42, 63, 75, 12, 33, 26, 39

35, 47, 43, 52, 56, 59, 64, 77, 15, 21

51, 54, 72, 68, 36, 65, 52, 60, 27, 34

47, 48, 55, 58, 59, 62, 51, 48, 50, 41

57, 65, 54, 43, 56, 44, 30, 46, 67, 53

a. Construct a frequency distribution table for the marks of the 50 students. A guide is shown below.

(4 marks)

Class Limit	Class Boundary	Frequency
10 - 19	9.5 – 19.5	
20 - 29	19.5 – 29.5	

b. Calculate the relative frequency and the percentage for each class. You may insert additional columns to the table from question 1(a).   (3 marks)

c. Draw the frequency histogram and frequency polygon on the same graph.
(3 marks)

Question 2 (10 marks)

a. The probability density function of a random variable X is given below:

$$f(x) = \begin{cases} \dfrac{x^2 + k}{15} & ; 0 \le x < 3 \\ 0 & ; \text{otherwise} \end{cases}$$

Calculate
i.   the value of k.   (3 marks)
ii. the $P(2 < X < 5)$ (3 marks)

b. A manufacturer of metal pistons finds that on the average, 12% of his pistons are rejected because they are either oversized or undersized. What is the probability that a batch of 10 pistons will contain

i.   2 rejects?   (2 marks)
ii. at least 2 rejects?   (2 marks)

Continued...

Question 3 (10 marks)

a.   The average distance covered by a car in one hour is found to be normally distributed with a mean of 105 km and a standard deviation of 10 km.

    i.   Find the probability that the distance covered is between 100 km and 120 km? (2 marks)

    ii.   Given the probability that the average distance is more than k miles is 0.025, find the value of k. (3 marks)

b.   The average number of road accidents that occur on a particular stretch of road during a month is 7.

    i.   What is the probability of observing exactly three accidents on this stretch of road next month? (2 marks)

    ii.   What is the probability that more than 12 accidents occur in two months? (3 marks)

Question 4 (10 marks)

a.   Six giant watermelons are displayed in an agriculture exhibition booth. The weight for each is also displayed.

Watermelon	A	B	C	D	E	F
Weight (kg)	19	14	15	9	10	17

    i.   Calculate the population mean weight, μ. (1 mark)

    ii.   List all the possible samples of size five from this data and construct a sampling distribution of the sample mean. (4 marks)

b.   The price of a college book has a mean of RM95 with a standard deviation of RM10. Fifty books are randomly selected and their price are recorded. Find the probability that the mean price of the fifty books will be within RM2 of the population mean. (5 marks)

Continued...

Question 5 (10 marks)

a. A doctor claims that those who are 17 years old have an average body temperature that is higher than the commonly accepted average human temperature of 37 degrees celcius. A random sample of 40 people, of age 17 years old, is selected from a normally distributed population. The average temperature of the sample is found to be 37.17 degrees celcius. Given the population standard deviation of everyone who is 17 years old is 0.6 degrees celcius.

    i.   Set up the hypothesis test, H_0 and H_1.   (2 marks)

    ii.   At the 0.05 level of significance, is there evidence to show that the claim by the doctor is true?   (4 marks)

b. The operations manager of a large production plant would like to estimate the mean amount of time a worker takes to assemble a new electronic component. Assume that the standard deviation of this assembly time is 3.6 minutes. After observing 120 workers assembling similar devices, the manager noticed that their average time was 16.2 minutes. Construct a 92% confidence interval for the mean assembly time.   (4 marks)

End of Paper

APPENDIX

FORMULA

For Grouped Data

1.   Mode $= L + \left[\dfrac{f_m - f_B}{(f_m - f_B) + (f_m - f_A)}\right] c$

2.   Median $= L + \left[\dfrac{\left[\dfrac{\sum f + 1}{2}\right] - F_L}{f_m}\right] c$

3.   Mean =

Sample	Population
$\bar{x} = \dfrac{\sum mf}{\sum f}$	$\mu = \dfrac{\sum mf}{\sum f}$

4.   Variance =

Sample	Population
$s^2 = \dfrac{\sum m^2 f - \dfrac{\left(\sum mf\right)^2}{\sum f}}{\left(\sum f\right) - 1}$	$\sigma^2 = \dfrac{\sum m^2 f - \dfrac{\left(\sum mf\right)^2}{\sum f}}{\sum f}$

5.   Standard Deviation $= \sqrt{Variance}$